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Information Technology: When is it Worth the Investment?

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ABSTRACT

As companies attempt to streamline work processes and reduce costs, analyzing the role of information technology continues to be essential in such efforts. CEOs are now more skeptical regarding the contribution of information technology to the overall financial performance of the company. They doubt that IT direction is meaningfully linked to business goals. Therefore, before the person performing the role of CIO prepares a recommendation for investment in IT technology/systems it is critical to support their case with hard data showing clearly the expected return on the investment. Even though more data is available to assist CIO's in making IT decisions, most CIOs continue to experience difficulty in demonstrating the value of IT investments. This paper examines the research over the last 10 years on IS/IT investment value in an effort to highlight issues that should be considered before investing in information technology.

INTRODUCTION

We live in a world of remarkable change in Information Technology (IT). Business firms face a variety of opportunities to implement new IT-enabled initiatives; many of which have at least a theoretical potential to increase productivity and profitability for the business. However, research attempting to demonstrate the value of investment in IT has not provided a clear indication of how IT spending provides a pay-off. Indeed, Shin, Dow and Grover (2001) argue that the results of studies relating IT investments and organizational performance in the last 10 years have been equivocal. These contradictory perspectives have been attributed primarily to the inadequacies of productivity measurement as well as time lags due to an IT "learning effect" or a time consuming period of complementary organization changes (Brynjolfsson & Hit, 1998). Still others have argued that many of the intangible benefits of IT have not been appropriately measured. Each of these explanations provides information about the issues related to IT investment value and will be explored in this short review.

The intangible benefits of IT in areas such as improved quality, variety, timeliness and customization have been subject of continuous debates. Some researchers argue that such benefits have not been appropriately measured (Shin, Dow and Grover, 2001). Brynjolfsson and Hit (1998) suggested that this is primarily due to the use of conventional productivity measurement techniques such as return on investment and cost benefit analysis. The reality is that there are many factors that influence an organization's performance and one or a combination of even two does not necessarily provide a conclusive picture of an organization's current status. Given these measurement challenges, it is extremely difficult to establish the causality between IT investment and firm level output performance or profitability.

Early in the Nineties the studies were oriented toward measuring customer satisfaction (De Lone & McLean, 1992). User satisfaction has been an appealing measure since IT professionals frequently have difficulty delivering systems that satisfy users, and it is often necessary to have satisfied users if there is to be a good chance that a positive return on the investment will be obtained. Having satisfied users, however, does not necessarily mean that the investment will increase firm value (Dos Santos, 1993). For example, giving managers the information they want will typically lead to satisfied managers, but may have no impact on producing positive outcomes such as profitability or

productivity. Likewise, the fact that a system is used to provide such data does not mean that it will add value to overall business productivity and profitability (Ackoff, 1967).

Dos Santos, Peffers and Mauer (1993) note that other studies have determined the impact of IT investments on the outcome of internal activities and processes, using dependent variable measures such as material costs, operating expenses and product defects (Harris & Katz, 1991). They remark that the use of such measures has the advantage that the IT investment is expected to directly affect performance of these activities and processes. The disadvantage, they add, is that the measures are difficult to directly link to changes in firm value.

Brynjolfsson and Hitt (1993) observed, based on 1,000 observations on output and several inputs at the organizational level for 1987-1991, that computer capital and IT staff spending contributed significantly to firm level output. They also affirmed that the return on investment for computer capital was higher than the one for non-computer capital.

Subsequently they wrote a document that is considered a milestone in IT value research: "Productivity, Profit and Consumer Welfare - Three Different Measures of Information Technology's Value" (1996). In their study, they separated the issue of IT value into three dimensions: the effect of IT on productivity, the effects of IT on business profitability, and the effect of IT on consumer surplus. Their empirical examination confirmed that, like any multidimensional object, IT's value can look different depending on the vantage point chosen. They found evidence that IT may increase productivity and consumer surplus but not necessarily lead to supranormal business profits. They also showed that there is no inherent contradiction in the idea that IT can create value but destroy profits.

Hitt and Brynjolfsson (1996) indicated that from a managerial perspective it is important to understand how investment in IT affects the bottom line. Their theoretical discussion suggested that it is possible for firms to realize productivity benefits from effective management of IT, without seeing these benefits translate into higher profitability. They suggested that, on average, firms were making the IT investments necessary to maintain competitive parity but not to gain competitive advantage. Following this logic, Hitt and Brynjolfsson (1996) proposed two potential insights for managers:

First, when cost is the central strategic issue in an industry, our productivity results suggest that IT investment may be one way to pursue a cost leadership strategy, provided that the cost reductions cannot be emulated by other firms. However, for industries where cost is not the central strategic issue or where there are few barriers to adoption of IT, firms are unlikely to create lasting competitive advantage simply by spending more on IT. This raises the second issue: managers seeking higher profits should look beyond productivity to focus on how IT can address other strategic levers such as product position, quality, or customer service. While IT can potentially lower cost of providing these services, attaining competitive advantage may involve using IT to radically change the way products or services are produced and delivered in a way that can not be duplicated by competitors.

Given these insights, Hitt and Brynjolfsson concluded that with regard to business profitability, IT spending is not the sole determinative of success. Indeed, a myriad of factors must be considered, namely the company's costs, product, quality, customer service, competition and competitive advantage, before IT adoption. Only after careful analysis, and only in cases where IT adoption is likely to bring about either a cost leadership advantage and/or a strategic levers advantage would IT adoption likely lead to a strong investment value.

IT investments that serve as a company's strategic advantage over competitors may also play a factor in how announcements of IT investments affects a company's common stock prices (Dos Santos, Pfeffers & Mauer, 1993; Zmud & Richardson, 2001). In their analysis Don Santos et al. (1993) indicated that while there were no excess returns for any one industry, there were positive returns for innovative technologies (as opposed to non-innovative or follow-up IT technology) over the announcement period. Thus, they suggest that one can not simply conclude that stock prices will not be positively impacted by IT investments. IT investments may have a value to some firms; those that are innovative are more likely to be a value to the firm in terms of stock prices (Dos Santos et al., 1993; Zmud & Richardson, 2001). Likewise, companies that use IT in a transformational role most often do so in order to position themselves more favorably within an industry or to develop an "industry niche" by radically changing the industry's processes, practices and business models (Zmud & Richardson, 2001). Therefore, companies who adopt

innovative IT systems that are likely to serve as a competitive advantage or that are likely to create a radical change in business practices are more likely to be viewed favorably by the marketplace and consequently experience positive cash flows (Oh & Pinsonneault, 2007).

At the same time, others caution the impact of innovative IT investments on a company's market value (Zmud & Richardson, 2001). While Zmud and Richardson (2001) affirm the value of competitive strategy in being the first to market place with innovative IT adoption, being the first to adopt an innovation does not guarantee marketplace success in and of itself. These authors cite the high risk of being first with innovative technologies, especially with regard to uncertainties in the new technologies themselves as well as the implementation of such innovations. Again, given these challenges, being first does not always lead to a competitive advantage nor a positive marketplace reaction.

Finally, positive returns in the market place may depend on the size of the firm and the type of industry. Im, Dow and Grover (2001), using an event study methodology, concluded that IT spending was more likely to set up positive returns from announcements of IT investments for small size firms but not for larger firms. Moreover, Im et al. (2001) found evidence of increasing returns to IT investment announcements in the latter periods, i.e., the 1991-1996, but not the early period of 1981-1990. These positive returns were more likely to be realized for firms within the financial industry as opposed to firms in non-financial industries in this latter time period.

CONCLUSION

Thousands of companies have implemented large and small IT investments in software applications, work process, business organization, supply chain management and customer relationship management. Even though technology investments have contributed significantly to output growth in the United States, profitability and productivity have not always emerged as a result of IT investments. A growing body of research aimed at understanding the circumstances around when IT investments lead to positive outcomes has suggested that several factors, including a firm's strategic advantage and innovative technologies, are related to whether or not IT investments are likely to yield positive results. When IT investments, such as new work systems are coupled with organizational redesign and business process reengineering, these changes are more likely to yield substantial productivity improvements, and perhaps even long-term structural changes in the economy, since many of these changes are likely to lead to a competitive advantage. However, it is imperative for CIO's and others making decisions regarding the value of information systems within their organization to adequately analyze the necessity of making such an investment as well as the primary reasons behind an IT adoption. If those reasons primarily include a strong competitive advantage and/or an innovation that is likely to change the way the industry conducts business in terms of process, practice or business model, then IT adoption is more likely to be experienced positively. Certainly, IT investment should not be undertaken lightly or simply to adopt technology for technology's sake alone. Doing so is likely to not only cost the company financially, but also likely cost the firm's strategic advantage. The final decision of whether to adopt an IT technology or not must be in line with the firm's strategic plan and business direction. It is only at this point that IT is likely to have a pay-off.

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